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TOSHIBA

Leading Innovation

AIR CONDITIONER (SPLIT TYPE)
Installation manual

HFC R410A

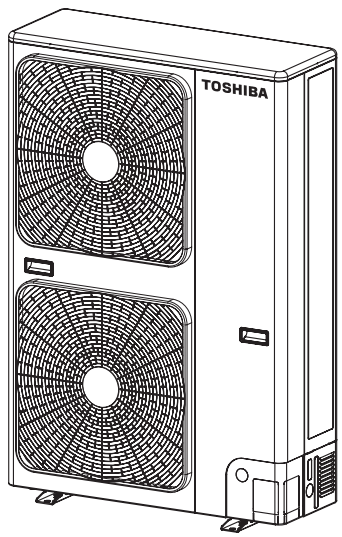
Outdoor Unit

Model name:

RAV-SM1603AT-E
RAV-SM1603ATZ-E
RAV-SM1603ATZG-E

Not accessible to the general public
Vente interdite au grand public
Kein öffentlicher Zugang
Non accessibile a clienti generici
No destinado al público en general
Não acessível ao público em geral
Niet geschikt voor huishoudelijk gebruik
Μη προσβάσιμο από το γενικό κοινό
Недоступен для посторонних
Genel erişime açık değildir

Installation manual Air conditioner (Split type)	1	English
Manuel d'installation Climatiseur (Type split)	25	Français
Installations-handbuch Klimagerät (Split-typ)	49	Deutsch
Manuale di installazione Condizionatore d'aria (Tipo split)	73	Italiano
Manual de instalación Aire acondicionado (Tipo split)	97	Español
Manual de Instalação Ar condicionado (Tipo split)	121	Português
Installatiehandleiding Airconditioner (Gesplitst type)	145	Nederlands
Εγχειρίδιο εγκατάστασης Κλιματιστικό (Τύπου Split)	169	Ελληνικά
Руководство по установке Кондиционер воздуха (сплит-система)	193	Русский
Montaj Kılavuzu Klima (Split tip)	217	Türkçe



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Please read this Installation Manual carefully before installing the Air Conditioner.
- This Manual describes the installation method of the outdoor unit.
- For installation of the indoor unit, follow the Installation Manual attached to the indoor unit.

ADOPTION OF NEW REFRIGERANT

This Air Conditioner is a new type which adopts a new refrigerant HFC (R410A) instead of the conventional refrigerant R22 in order to prevent destruction of the ozone layer.

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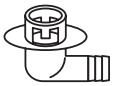
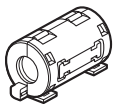
1 ACCESSORY PARTS AND REFRIGERANT

■ Accessory parts

Part name	Q'ty	Shape	Usage
Outdoor unit Installation manual	1		(Hand this directly to the customer.)
Drain nipple	1		
Waterproof rubber cap	5		
Protective bush	1		For protecting wires (pipe cover)
Guard material for passage part	1		For protecting passage part (pipe cover)
Ferrite core	1		For conforming to EMC standards for twin/triple systems Color: White (Used for indoor/outdoor connecting wires)
Clamp filter	1		For conforming to EMC standards for twin/triple systems Color: Gray (Used for outdoor fan motor lead wire)
Banding band	2		For conforming to EMC standards for twin/triple systems (For clamping the clamp filter and ferrite core)

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■ Refrigerant Piping

- Piping kit used for the conventional refrigerant cannot be used.
- Use copper pipe with 0.8 mm or more thickness for Ø9.5 mm.
  Use copper pipe with 1.0 mm or more thickness for Ø15.9 mm.
- Flare nut and flare works are also different from those of the conventional refrigerant.
  Take out the flare nut attached to the air conditioner, and use it.

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2 PRECAUTIONS FOR SAFETY

- Ensure that all Local, National and International regulations are satisfied.
- Read this “PRECAUTIONS FOR SAFETY” carefully before Installation.
- The precautions described below include the important items regarding safety.
  Observe them without fail.
- After the installation work, perform a trial operation to check for any problem.
  Follow the Owner’s Manual to explain how to use and maintain the unit to the customer.
- Turn off the main power supply switch (or breaker) before the unit maintenance.
- Ask the customer to keep the Installation Manual together with the Owner’s Manual.

⚠ WARNING

- **Ask an authorized dealer or qualified installation professional to install/maintain the air conditioner.**
  Inappropriate installation may result in water leakage, electric shock or fire.
- **Be sure to connect earth wire. (grounding work)**
  Incomplete grounding cause an electric shock.
  Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone wires.
- **Turn off the main power supply switch or breaker before attempting any electrical work.**
  Make sure all power switches are off. Failure to do so may cause electric shock.
  Use an exclusive power circuit for the air conditioner. Use the rated voltage.
- **Connect the connecting wire correctly.**
  If the connecting wire is connected in a wrong way, electric parts may be damaged.
- **When moving the air conditioner for the installation into another place, be very careful not to enter any gaseous matter other than the specified refrigerant into the refrigeration cycle.**
  If air or any other gas is mixed in the refrigerant, the gas pressure in the refrigeration cycle becomes abnormally high and it may resultingly causes pipe burst and injuries on persons.
- **Do not modify this unit by removing any of the safety guards or by by-passing any of the safety interlock switches.**
- **After unpacking the unit, examine it carefully if there are possible damage.**
- **Do not install in a place that might increase the vibration of the unit.**
- **To avoid personal injury (with sharp edges), be careful when handling parts.**
- **Perform installation work properly according to the Installation Manual.**
  Inappropriate installation may result in water leakage, electric shock or fire.
- **When the air conditioner indoor unit is installed in a small room, provide appropriate measures to ensure that the concentration of refrigerant leakage occur in the room does not exceed the critical level.**
- **Tighten the flare nut with a torque wrench in the specified manner.**
  Excessive tightening of the flare nut may cause a crack in the flare nut after a long period, which may result in refrigerant leakage.
- **Wear heavy gloves during the installation work to avoid injury.**
- **Install the air conditioner securely in a location where the base can sustain the weight adequately.**
- **Perform the specified installation work to guard against an earthquake.**
  If the air conditioner is not installed appropriately, accidents may occur due to the falling unit.
- **If refrigerant gas has leaked during the installation work, ventilate the room immediately.**
  If the leaked refrigerant gas comes in contact with fire, noxious gas may generate.
- **After the installation work, confirm that refrigerant gas does not leak.**
  If refrigerant gas leaks into the room and flows near a fire source, such as a cooking range, noxious gas might generate.
- **Electrical work must be performed by a qualified electrician in accordance with the Installation Manual. Make sure the air conditioner uses an exclusive power supply.**
  An insufficient power supply capacity or inappropriate installation may cause fire.
- **Use the specified wires for wiring connect the terminals securely fix.**
  To prevent external forces applied to the terminals from affecting the terminals.

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⚠ WARNING

- **When the air conditioner cannot cool or heat a room well, contact the dealer from whom you purchased the air conditioner as refrigerant leakage is considered as the cause.**
  In the case of repair that requires refill of refrigerant, ask service personnel about details of the repair.
  The refrigerant used in the air conditioner is harmless.
  Generally, the refrigerant does not leak. However, if the refrigerant leaks in a room and a heater or stove burner in the room catches fire, it may generate toxic gas.
  When you ask service personnel for repairing refrigerant leakage, confirm that the leakage portion has been completely repaired.
- **Conform to the regulations of the local electric company when wiring the power supply.**
  Inappropriate grounding may cause electric shock.
- **Do not install the air conditioner in a location subject to a risk of exposure to a combustible gas.**
  If a combustible gas leaks, and stays around the unit, a fire may occur.
- **Install the refrigerant pipe securely during the installation work before operating the air conditioner.**
  If the compressor is operated with the valve open and without the refrigerant pipe, the compressor sucks air and the refrigeration cycle is overpressurized, which may cause a burst or injury.
- **For the refrigerant recovery work (collection of refrigerant from the pipe to the compressor), stop the compressor before disconnecting the refrigerant pipe.**
  If the refrigerant pipe is disconnected while the compressor is working with the valve open, the compressor sucks air and the refrigeration cycle is overpressurized, which may cause a burst or injury.

⚠ CAUTION

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New Refrigerant Air Conditioner Installation

- **THIS AIR CONDITIONER ADOPTS THE NEW HFC REFRIGERANT (R410A) WHICH DOES NOT DESTROY OZONE LAYER.**
- The characteristics of R410A refrigerant are ; easy to absorb water, oxidizing membrane or oil, and its pressure is approx. 1.6 times higher than that of refrigerant R22. Accompanied with the new refrigerant, refrigerating oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigerating oil does not enter the refrigerating cycle.
- To prevent charging an incorrect refrigerant and refrigerating oil, the sizes of connecting sections of charging port of the main unit and installation tools are changed from those for the conventional refrigerant.
- Accordingly the exclusive tools are required for the new refrigerant (R410A).
- For connecting pipes, use new and clean piping designed for R410A, and please care so that water or dust does not enter.

To Disconnect the Appliance from Main Power Supply

- This appliance must be connected to the main power supply by means of a switch with a contact separation of at least 3 mm.
- The installation fuse 40 A (All type fuse can be used) must be used for the power supply line of this conditioner.

3 INSTALLATION OF NEW REFRIGERANT AIR CONDITIONER

- The R410A refrigerant is more susceptible to impurities such as water, oxide membrane, oils, and fats. With the adoption of the new refrigerant, refrigerating oil has also been changed.
  Be careful so that water, dust, conventional refrigerant, and/or conventional refrigerating oil do not enter the refrigerating cycle of the new refrigerant air conditioner.
- To prevent different refrigerant or refrigerating oil being mixed, the sizes of the charging port of the unit and the installation tool connecting sections are different from the conventional refrigerant. Accordingly the following exclusive tools are required for the new refrigerant R410A.

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■ Required Tools/Equipment and Precautions for Use

Prepare the tools and equipment listed in the following table before starting installation work.
Newly prepared tools and equipment must be used exclusively.

Legend

△: Prepared newly (Use for R410A only. Do not use for refrigerant R22 or R407C etc..)
◎: Conventional tools/equipment are available

Tools/equipment	Use	How to use tools/equipment
Gauge manifold	Vacuuming/charging refrigerant and operation check	△ Prepared newly for R410A only
Charging hose		△ Prepared newly for R410A only
Charging cylinder	Can not be used	Unusable (Use the refrigerant charging measure instead.)
Gas leak detector	Gas leak check	△ Prepared newly
Vacuum pump with backflow prevention function	Vacuum drying	Unusable
Vacuum pump with backflow prevention function	Vacuum drying	◎ R22 (Conventional tools)
Flare tool	Flare machining of pipes	◎ Usable if dimensions are adjusted.
Bender	Bending pipes	◎ R22 (Conventional tools)
Refrigerant recovery equipment	Refrigerant recovery	△ For R410A only
Torque wrench	Tightening flare nuts	△ Exclusive for Ø12.7 mm and Ø15.9 mm
Pipe cutter	Cutting pipes	◎ R22 (Conventional tools)
Refrigerant cylinder	Charging refrigerant	△ For R410A only Discriminated by the refrigerant name on the cylinder.
Welding machine and nitrogen cylinder	Welding pipes	◎ R22 (Conventional tools)
Refrigerant charging measure	Charging refrigerant	◎ R22 (Conventional tools)

■ Refrigerant Piping

New refrigerant (R410A)

When using the conventional piping kit

- When using the conventional piping kit that has no indication of applicable refrigerant types, be sure to use it with a wall thickness of 0.8 mm for Ø6.4 mm, Ø9.5 mm, and Ø12.7 mm, and with a wall thickness of 1.0 mm for Ø15.9 mm. Never use the conventional piping kit with a wall thickness less than these thicknesses due to insufficient pressure capacity.

When using general copper pipes

- Use general copper pipes with a wall thickness of 0.8 mm for Ø6.4 mm, Ø9.5 mm, and Ø12.7 mm, and with a wall thickness of 1.0 mm for Ø15.9 mm.
  Never use any copper pipes with a wall thickness less than these thicknesses.

Flare nuts and flare machining

- The flare nuts and flare machining are different from those for the conventional refrigerant.
  Use the flare nuts supplied with the air conditioner or those for R410A.
- Before performing flare machining, carefully read “REFRIGERANT PIPING”

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4 SELECTION OF INSTALLATION

■ Before installation

Be careful to the following items before installation.

Length of refrigerant pipe

Length of refrigerant pipe connected to indoor/outdoor unit	Item
5 m to 30 m	Addition of refrigerant is unnecessary at the local site.
*31 m to 50 m	<Addition of refrigerant> Add 40 g of refrigerant for every 1m of pipe which exceeds 30 m.

* Caution at addition of refrigerant
When the total length of refrigerant pipe exceeds 30 m, add 40 g /m of refrigerant and the maximum total length of pipe is 50 m. (Max. amount of additional refrigerant is 800 g.)
Charge the refrigerant accurately. Overcharge may cause a serious trouble of compressor.

* Do not connect a refrigerant pipe shorter than **5 m**.
This may cause a malfunction of the compressor or other devices.

■ Airtight test

1. Before starting an airtight test, further tighten the spindle valves on the gas side and liquid side.
2. Pressurize the pipe with nitrogen gas charged from the service port to the design pressure (4.15 Mpa) to conduct the airtight test.
3. After the airtight test is completed, evacuate the nitrogen gas.

Air purge

- For air purge, use a vacuum pump.
- Do not use refrigerant charged in the outdoor unit for air purge. (The refrigerant for air purge is not contained in the outdoor unit.)

Electrical wiring

- Be sure to fix the power wires and indoor/ outdoor connecting wires with clamps so that they do not contact with the cabinet, etc.

Earthing

⚠ WARNING

Make sure that proper earthing is provided.
Improper earthing may cause electric shock. For how to check earthing, contact the dealer who installed the air conditioner or a professional installation company.

- Proper earthing can prevent charging of electricity on the outdoor unit surface due to high frequency of the frequency converter (inverter) in the outdoor unit, as well as prevent electric shock. If the outdoor unit is not properly earthed, you may feel electric shock.
- **Be sure to connect earth wire. (grounding work)**
  Incomplete grounding cause an electric shock. Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone wires.

Test Run

Turn on the leakage breaker at least 12 hours before starting a test run to protect the compressor during startup.

⚠ CAUTION

Incorrect work may result in a malfunction or complaints of customers.

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■ Installation Place

⚠ WARNING

Install the outdoor unit properly at a place that is durable enough to the weight of the outdoor unit.
Insufficient durability may cause the outdoor unit to fall, which may result in injury.

⚠ CAUTION

Do not install the outdoor unit at a place subject to combustible gas leak.
Accumulation of combustible gas around the outdoor unit may cause a fire.

Install the outdoor unit at a place that meets the following conditions after customer's consent is obtained.

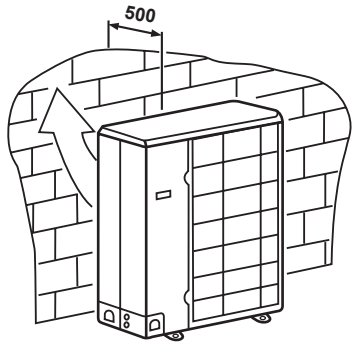
- A well-ventilated place free from obstacles near the air inlets and air outlet
- A place that is not exposed to rain or direct sunlight
- A place that does not increase the operating noise or vibration of the outdoor unit
- A place that does not cause any drainage problem with discharged water

Do not install the outdoor unit at the following places.

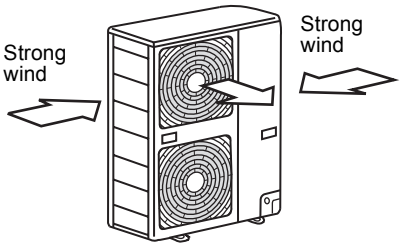
- A place full of saline atmosphere (coastal area) or sulfide gas (hot-spring area) (Special maintenance is required.)
- A place subject to oil, vapor, oily smoke, or corrosive gas
- A place where organic solvent is used
- A place where high-frequency equipment (including inverter equipment, private power generator, medical equipment, and communication equipment) is used (Installation in this place may cause malfunction of the air conditioner, abnormal control or problems due to noise to such equipment.)
- A place where the discharged air of the outdoor unit blows against the window of the neighboring house
- A place where the operating noise of the outdoor unit is transmitted
- When the outdoor unit is installed in an elevated position, be sure to secure its feet.
- A place where the drain water does not make any problem.

⚠ CAUTION

1. Install the outdoor unit at a place where discharge air is not blocked.
2. When an outdoor unit is installed in a place that is always exposed to a strong wind like a coast or on a high storey of a building, secure a normal fan operation by using a duct or a wind shield.
3. When installing the outdoor unit in a place that is constantly exposed to a strong wind such as the upper stairs or rooftop of a building, apply the windproof measures referring to the following examples.
   1) Install the unit so that its discharge port faces to the wall of the building. Keep a distance 500 mm or more between the unit and the wall surface.

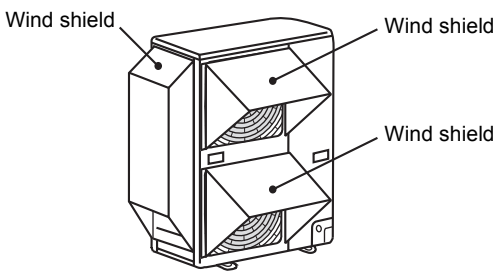


   2) Supposing the wind direction during the operation season of the air conditioner, install the unit so that the discharge port is set at right angle to the wind direction.



- When using an air conditioner under low outside temperature condition (Outside temp.:-5 °C or lower) with COOL mode, prepare a duct or wind shield so that it is not affected by the wind.

<Example>



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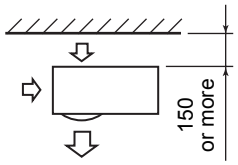
■ Necessary Space for Installation (Unit:mm)

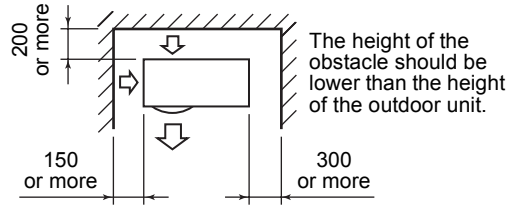
Obstacle at rear side

▼ Upper side is free

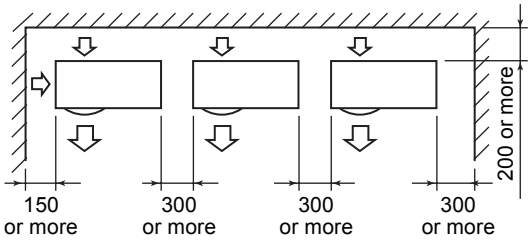
1. Single unit installation



2. Obstacles at both right and left sides.

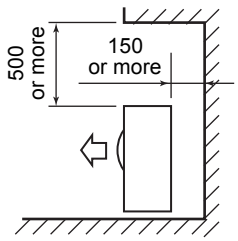


3. Serial installation of two or more units



The height of the obstacle should be lower than the height of the outdoor unit.

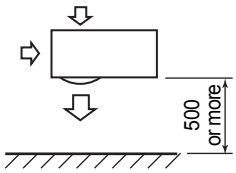
▼ Obstacle also at the upper side



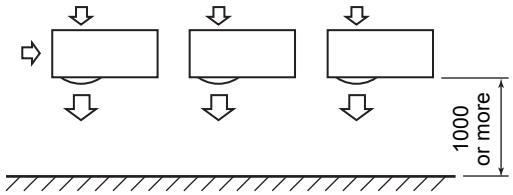
Obstacle at front side

▼ Upper side is free

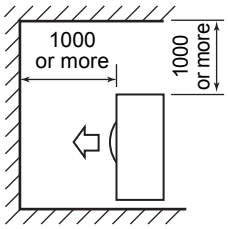
1. Single unitIn installation



2. Serial installation of two or more units



▼ Obstacle also at the upper side

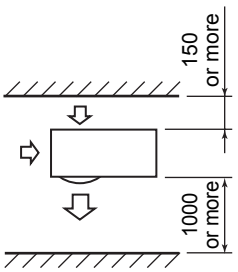


Obstacles at both front and rear sides

Open the upper side and both right and left sides. The height of obstacle at both front and rear side, should be lower than the height of the outdoor unit.

▼ Standard installation

1. Single unit installation



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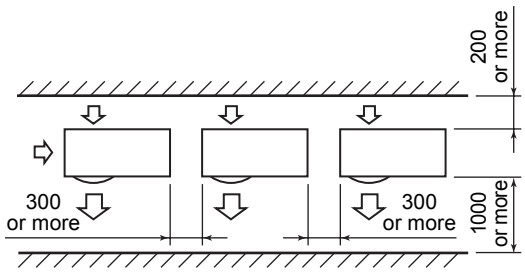
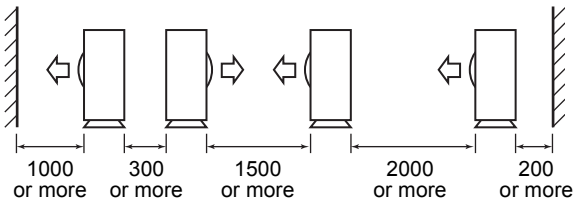
2. Serial installation of two or more units



Serial installation at front and rear sides

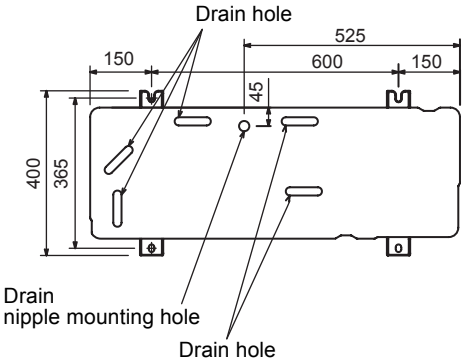
Open the upper side and both right and left sides. The height of obstacle at both front and rear sides should be lower than the height of the outdoor unit.

▼ Standard installation



■ Installation of Outdoor Unit

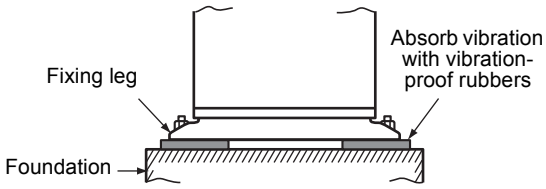
- Before installation, check strength and horizontality of the base so that abnormal sound does not generate.
- According to the following base diagram, fix the base firmly with the anchor bolts. (Anchor bolt, nut: M10 x 4 pairs)



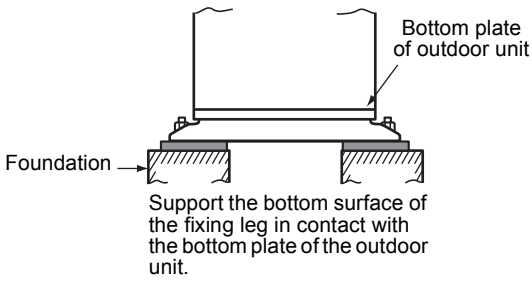
- As shown in the figure below, install the foundation and vibration-proof rubbers to directly support the bottom surface of the fixing leg that is in contact with the bottom plate of the outdoor unit.

* When installing the foundation for an outdoor unit with downward piping, consider the piping work.

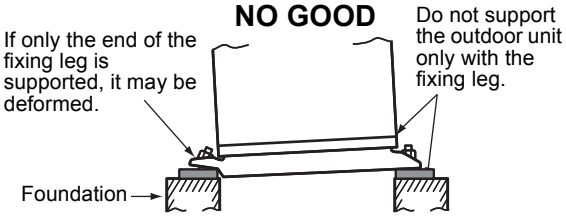
GOOD



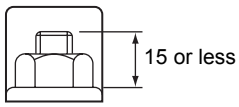
GOOD



NO GOOD



Set the out margin of the anchor bolt to 15 mm or less.



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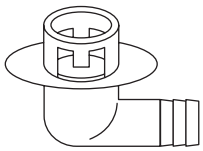
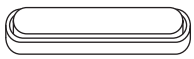
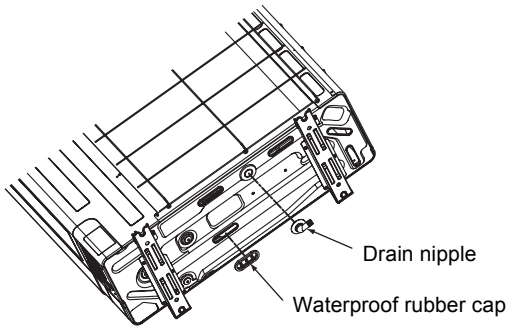
- In case of drainning through the drain hose, attach the following drain nipple and the waterproof rubber cap, and use the drain hose (Inner diam.: 16 mm) sold on the market. And also seal the screws securely with silicone material, etc. so that water does not drop down. Some conditions may cause dewing or dripping of water.
- When collectively draining discharged water completely, a drain pan must be made locally.



Drain nipple



Waterproof rubber cap (5pcs.)



■ For Reference

If a heating operation would be continuously performed for a long time under the condition that the outdoor temperature is 0 °C or lower, draining of defrosted water may be difficult due to freezing of the bottom plate, resulting in a trouble of the cabinet or fan.

It is recommended to procure an anti-freeze heater locally for a safety installation of the air conditioner.

For details, contact the dealer.

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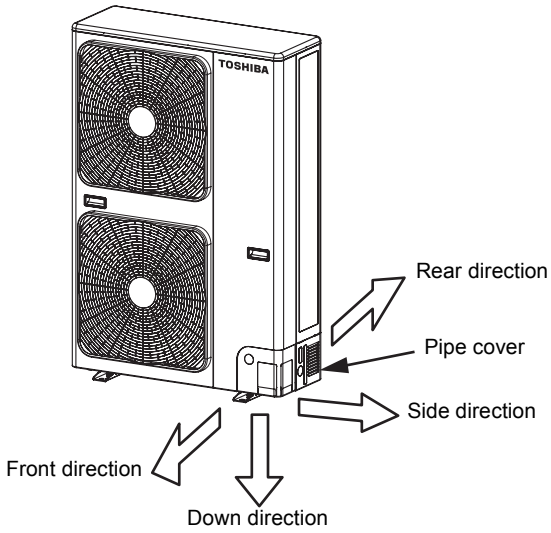
5 REFRIGERANT PIPING

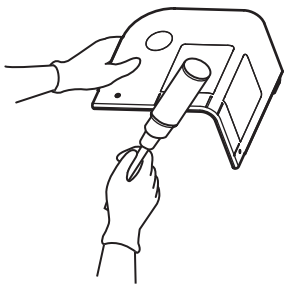
■ Knockout of Pipe Cover



Knockout procedure

- The indoor/outdoor connecting pipes can be connected to 4 directions.
  Take off the knockout part of the pipe cover in which pipes or wires pass through the base plate.
- Detach the piping cover and give an impact on the knockout section a few times with the shank of a screwdriver. A knockout hole can easily be punched.
- After punching the knockout hole, remove burrs of the hole and then install the supplied protective bush and guard material for passage part to protect wires and pipes.
  Be sure to attach the pipe covers after pipes have been connected. Cut the slits under the pipe covers to facilitate the installation.

  After connecting the pipes, be sure to mount the pipe cover. The pipe cover is easily mounted by cutting off the slit at the lower part of the pipe cover.



* Be sure to wear heavy work gloves while working.

■ Optional Installation Parts (Local Procure)

	Parts name	Q'ty
A	Refrigerant piping Liquid side : Ø9.5 mm Gas side : Ø15.9 mm	Each one
B	Pipe insulating material (polyethylene foam, 10 mm thick)	1
C	Putty, PVC tapes	Each one

■ Refrigerant Piping Connection

⚠ CAUTION

TAKE NOTICE THESE IMPORTANT 4 POINTS BELOW FOR PIPING WORK

1. Keep dust and moisture away from inside the connecting pipes.
2. Tightly connect the connection between pipes and the unit.
3. Evacuate the air in the connecting pipes using VACUUM PUMP.
4. Check gas leak at connected points.

▼ Piping connection

Liquid side		Gas side	
Outer diameter	**Thickness**	**Outer diameter**	**Thickness**
Ø9.5 mm	0.8 mm	Ø15.9 mm	1.0 mm

Flaring

1. **Cut the pipe with a pipe cutter.**
   Be sure to remove burrs that may cause gas leak.
2. **Insert a flare nut into the pipe, and then flare the pipe.**
   Use the flare nuts supplied with the air conditioner or those for R410A.
   Insert a flare nut into the pipe, and flare the pipe.
   As the flaring sizes of R410A differ from those of refrigerant R22, the flare tools newly manufactured for R410A are recommended.

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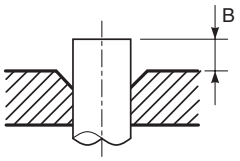
However, the conventional tools can be used by adjusting projection margin of the copper pipe.



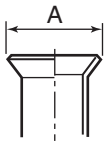
▼ Projection margin in flaring : B (Unit : mm)
Rigid (Clutch type)

Outer diam. of copper pipe	R410A tool used	Conventional tool used
	R410A	
9.5	0 to 0.5	1.0 to 1.5
15.9		

▼ Flaring diam. meter size : A (Unit : mm)

Outer diam. of copper pipe	A+0 ~ A−0.4
9.5	13.2
15.9	19.7

* In case of flaring for R410A with the conventional flare tool, pull it out approx.
0.5 mm more than that for R22 to adjust to the specified flare size.
The copper pipe gauge is useful for adjusting projection margin size.

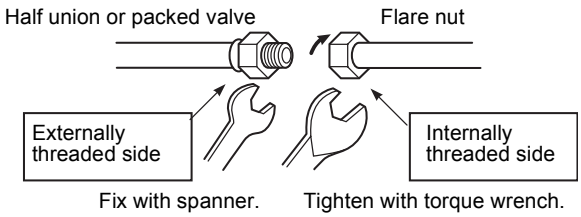


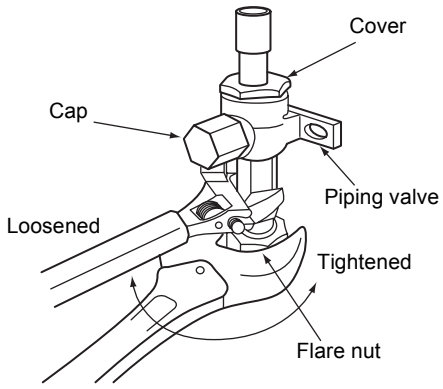
■ Tightening of Connecting Part

1. Align the centers of the connecting pipes and fully tighten the flare nut with fingers. Then fix the nut with a spanner as shown in the figure and tighten it with a torque wrench.
2. As shown in the figure, be sure to use two spanners to loosen or tighten the flare nut of the valve on the gas side. If you use a single spanner, the flare nut cannot be tightened to the required tightening torque.
   On the other hand, use a single spanner to loosen or tighten the flare nut of the valve on the liquid side.

(Unit: N•m)

Outer dia. of copper pipe	Tightening torque
9.5 mm (diam.)	33 to 42 (3.3 to 4.2 kgf•m)
15.9 mm (diam.)	68 to 82 (6.8 to 8.2 kgf•m)





Valve at gas side

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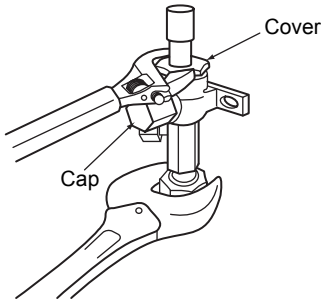
⚠ CAUTION

1. Do not put the spanner on the cap or cover. The valve may be broken.
2. If applying excessive torque, the nut may be broken according to some installation conditions.

- After the installation work, be sure to check gas leak of connecting part of the pipes with nitrogen.

NO GOOD



- Pressure of R410A is higher than that of R22 (Approx. 1.6 times).
  Therefore, using a torque wrench, tighten the flare pipe connecting sections which connect the indoor/outdoor units at the specified tightening torque.
  Incomplete connections may cause not only a gas leak, but also a trouble of the refrigeration cycle.

Do not apply refrigerating machine oil to the flared surface.

■ Refrigerant Pipe Length

Single

Allowable pipe length (m)	Height difference (Indoor-outdoor H) (m)		Pipe diameter (mm)		Number of bent portions
Total length L	Indoor unit: Upper	Outdoor unit: Lower	Gas side	Liquid side	10 or less
50	30	30	Ø15.9	Ø9.5	

Simultaneous twin, triple

System	Allowable pipe length (m)			Height difference (m)			Pipe diameter (mm)				Number of bent portions
	Total length • $\ell_1 + \ell_2$ • $\ell_1 + \ell_3$ • $\ell_1 + \ell_4$ Maximum	Distributed pipes • ℓ_2 • ℓ_4 • ℓ_3 Maximum	Distributed pipes • $\ell_3 - \ell_2$ • $\ell_4 - \ell_3$ • $\ell_4 - \ell_2$ Maximum	Indoor-outdoor H		Indoor-indoor (△h)	Main pipe		Branching pipe		
				Indoor unit: Upper	Outdoor unit: Upper		Gas side	Liquid side	Gas side	Liquid side	
TWIN	50	15	10	30	30	0.5	Ø15.9	Ø9.5	Ø15.9	Ø9.5	10 or less
TRIPLE	50	15	10	30	30	0.5	Ø15.9	Ø9.5	Ø12.7	Ø6.4	10 or less

Figure of Single

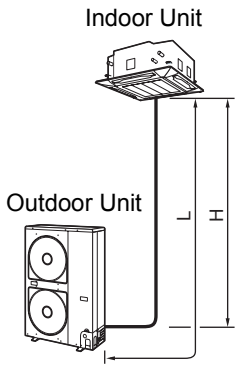


Figure of Simultaneous twin

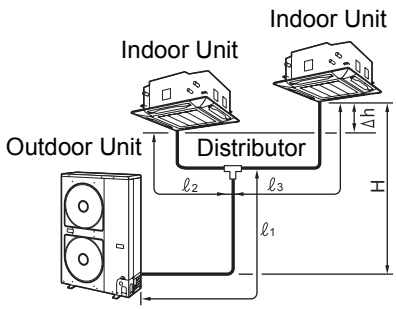
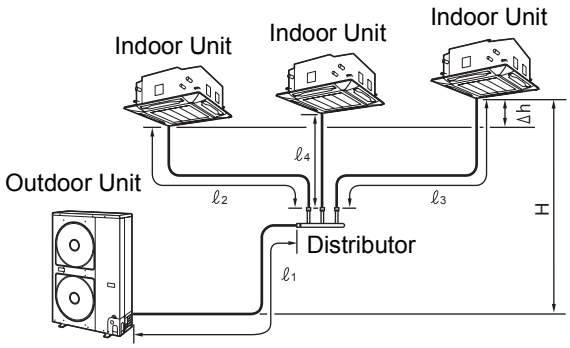


Figure of Simultaneous triple



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6 AIR PURGING

■ Airtight test

Before starting an airtight test, further tighten the spindle valves on the gas side and liquid side.
Pressurize the pipe with nitrogen gas charged from the service port to the design pressure (4.15 Mpa) to conduct the airtight test.
After the airtight test is completed, evacuate the nitrogen gas.

■ Air Purge

With respect to the preservation of terrestrial environment, adopt “Vacuum pump” for air purge (Evacuate air in the connecting pipes) when installing the unit.

- Do not discharge the refrigerant gas to the atmosphere to preserve the terrestrial environment.
- Use a vacuum pump to discharge the air (nitrogen, etc.) remained in the set. If the air remains, the capacity may decrease.

For the vacuum pump, be sure to use one with backflow preventer so that the oil in the pump does not backflow into the pipe of the air conditioner when the pump stops.
(If oil in the vacuum pump is put in an air conditioner including R410A, it may cause trouble on the refrigeration cycle.)

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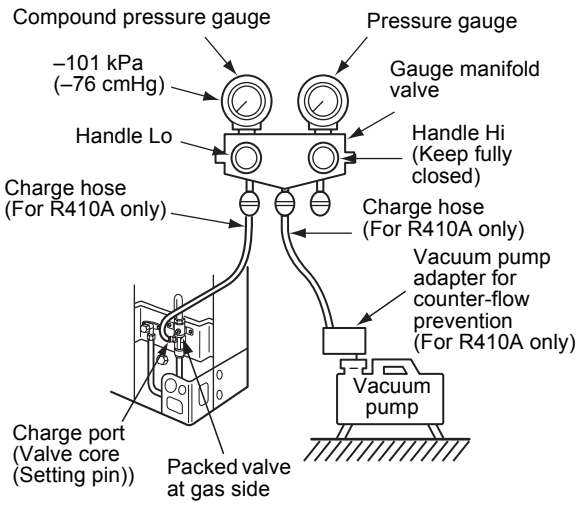
Vacuum pump

As shown in the figure, connect the charge hose after the manifold valve are closed completely.
↓
Attach the connecting port of the charge hose with a projection to push the valve core (setting pin) to the charge port of the set.
↓
Open handle Low fully.
↓
Turn ON the vacuum pump (*1)
↓
Loosen the flare nut of the packed valve (Gas side) a little to check the air passes through. (*2)
↓
Tighten the flare nut again.
↓
Execute vacuuming until the compound pressure gauge indicates –101kPa (–76cmHg). (*1)
↓
Close handle Low completely.
↓
Turn OFF the vacuum pump.
↓
Leave the vacuum pump as it is for 1 or 2 minutes, and check the indicator of the compound pressure gauge does not return.
↓
Open fully the valve stem or the valve handle. (First, at liquid side, then gas side)
↓

(continued)
↓
Disconnect the charge hose from the charge port.
↓
Tighten valve and caps of the charge port surely.

*1 Use the vacuum pump, vacuum pump adapter, and gauge manifold correctly referring to the manuals supplied with each tool before using them.
Check that the vacuum pump oil is filled up to the specified line of the oil gauge.

*2 When air is not charged, check again whether the connecting port of the discharge hose, which has a projection to push the valve core, is firmly connected to the charge port.



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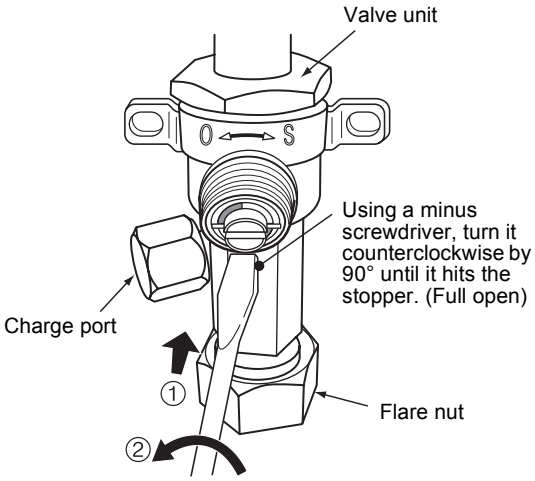
How to open the valve

Confirm the structure surely and then open or close the valve.

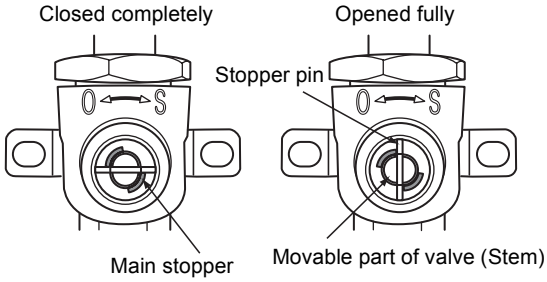
▼ Liquid side

Open the valve with a 4-mm hexagon wrench.

▼ Gas side


Valve unit
Using a minus screwdriver, turn it counterclockwise by 90° until it hits the stopper. (Full open)
Charge port
①
②
Flare nut

Handle position



- While the valve is fully opened, after the screwdriver has reached the stopper, do not apply torque exceeding 5N•m. Applying excessive torque may damage the valve.

Valve handling precautions

- Open the valve stem until it strikes the stopper. It is unnecessary to apply further force.
- Securely tighten the cap with a torque wrench.
- Cap tightening torque

Valve size	Ø9.5 mm	33 to 42 N•m (3.3 to 4.2 kgf•m)
	Ø15.9 mm	20 to 25 N•m (2.0 to 2.5 kgf•m)
Charge port		14 to 18 N•m (1.4 to 1.8 kgf•m)

■ Replenishing refrigerant

This model is a 30 m chargeless type that does not need to replenish refrigerant for refrigerant pipes up to 30 m. When a refrigerant pipe longer than 30 m is used, add the specified amount of refrigerant.

Refrigerant replenishing procedure

1. After the vacuuming of the refrigerant pipe is completed, close the valves and then charge refrigerant while the air conditioner is not working.
2. When the refrigerant cannot be charged to the specified amount, charge the required amount of refrigerant from the charge port of the valve on the gas side during cooling.

Requirement for replenishing refrigerant

Replenish liquid refrigerant.

When gaseous refrigerant is replenished, the refrigerant composition varies, which disables normal operation.

Additional amount of refrigerant

31~50m: L
40g×(L-30)

- L: Pipe length
- For additional amount of refrigerant for twin system and triple system, refer to the installation manual supplied with the branching pipe (sold separately).
- The refrigerant need not be reduced for a 30 meter (or less) refrigerant pipe.

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7 ELECTRICAL WORK

⚠ WARNING

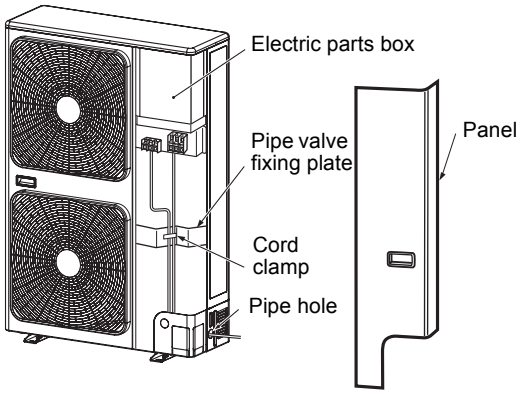
1. **Using the specified wires, ensure to connect the wires, and fix wires securely so that the external tension to the wires do not affect the connecting part of the terminals.**
   Incomplete connection or fixation may cause a fire, etc.
2. **Be sure to connect earth wire. (grounding work)**
   Incomplete grounding cause an electric shock. Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone wires.
3. **Appliance shall be installed in accordance with national wiring regulations.**
   Capacity shortage of power circuit or incomplete installation may cause an electric shock or a fire.

⚠ CAUTION

- Wrong wiring may cause a burn-out to some electrical parts.
- Be sure to use the cord clamps attached to the product.
- Do not damage or scratch the conductive core and inner insulator of power and inter-connecting wires when peeling them.
- Use the power and Inter-connecting wires with specified thickness, specified type and protective devices required.

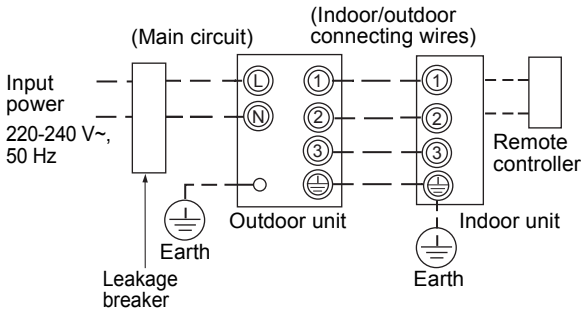
- Remove the panel, and you can see electric parts on the front side.
- A metal pipe can be installed through the hole for wiring. If the hole size does not fit the wiring pipe to be used, drill the hole again to an appropriate size.
- Be sure to clamp the power wires and indoor/outdoor connecting wires with banding band along the connecting pipe so that the wires do not touch the compressor or discharge pipe. (The compressor and the discharge pipe become hot.)

Furthermore, be sure to secure these wires with the pipe valve fixing plate and cord clamps stored in the electric parts box.



■ Wiring between Indoor Unit and Outdoor Unit

The dashed lines show on-site wiring.



- Connect the indoor/outdoor connecting wires to the identical terminal numbers on the terminal block of each unit.
  Incorrect connection may cause a failure.

For the air conditioner, connect a power wire as mentioned below.

Model RAV-	SM160
Power supply	220-240 V~, 50 Hz
Maximum running current	32 A
Installation fuse rating	40 A (all types can be used)
Power wire	H07 RN-F or 60245 IEC 66 (6.0 mm^2 or more)
Indoor/outdoor connecting wires	H07 RN-F or 60245 IEC 66 (1.5 mm^2 or more)
Earth wire	H07 RN-F or 60245 IEC 66 (1.5 mm^2 or more)

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How to wire

1. Connect the connecting wire to the terminal as identified with their respective numbers on the terminal block of indoor and outdoor unit.
   H07 RN-F or 60245 IEC 66 (1.5 mm^2 or more)
2. When connecting the connecting wire to the outdoor unit terminal, prevent water coming in the outdoor unit.
3. Insulate the unsheathed cords (conductors) with electrical insulation tape. Process them so that they do not touch any electrical or metal parts.
4. For inter connecting wire, do not use a wire jointed to another on the way.
   Use wires long enough to cover the entire length.
5. **Wiring differs depending on single system, twin system, and triple system to conform to EMC standards. Connect wires according to respective instructions.**

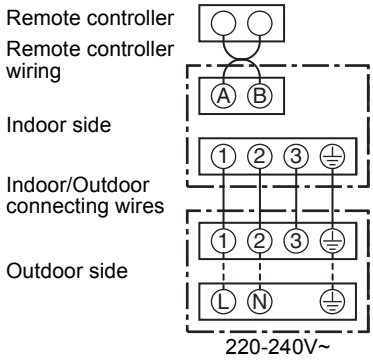
⚠ CAUTION

- The installation fuse must be used for the power supply line of this air conditioner.
- Incorrect/incomplete wiring might cause an electrical fire or smoke.
- Prepare the exclusive power supply for the air conditioner.
- This product can be connected to the mains.
  Connection to the fixed wiring :
  A switch which disconnects all poles and has a contact separation of at least 3 mm must be incorporated in the fixed wiring.

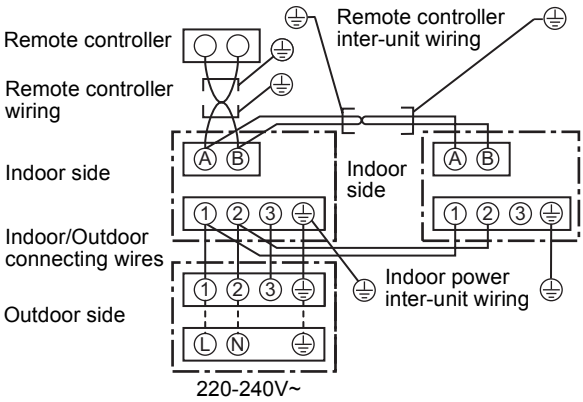
Wiring diagram

* For details of wiring/installation of the remote controller, refer to the Installation Manual enclosed to in the remote controller.

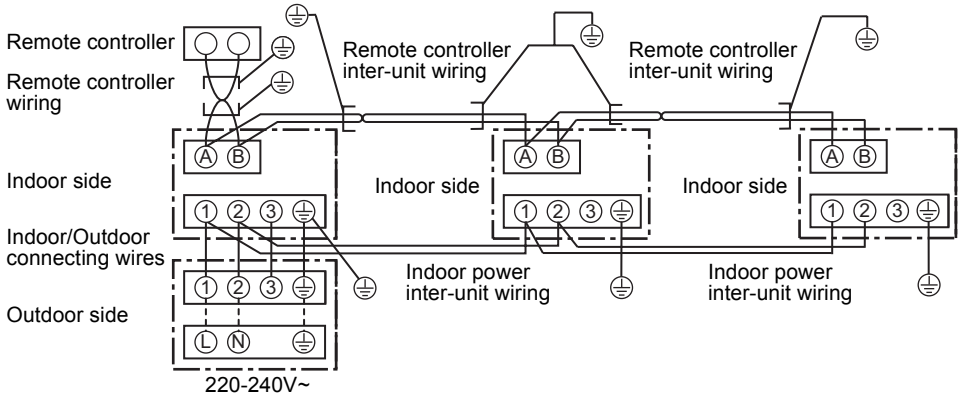
▼ Single system



▼ Synchronous twin system



▼ Synchronous triple system



* Use 2-core shield wire (MVVS 0.5 to 2.0 mm² or more) for the remote controller wiring in the synchronous twin and synchronous triple systems to prevent noise problems. Be sure to connect both ends of the shield wire to the earth.

* Connect earth wire for each indoor unit in the synchronous twin and synchronous triple systems.

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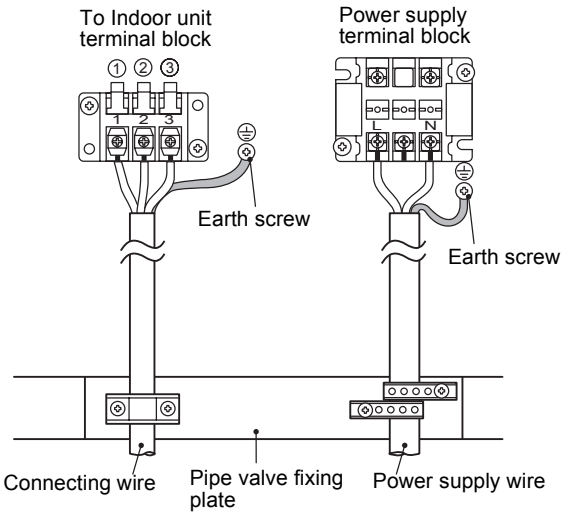
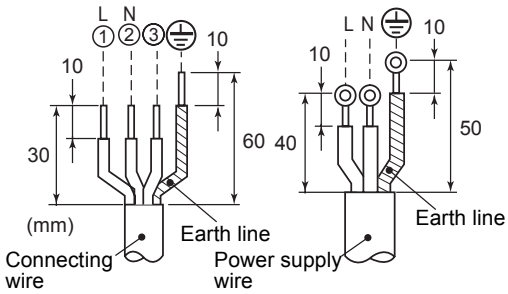
▼ Single system



Stripping length power cord and connecting wire



▼ Twin system, Triple system

⚠ WARNING

For the synchronous twin and synchronous triple systems, perform the following to conform to EMC standards.

1. Attach the supplied ferrite core (white) to indoor/outdoor connecting wires.
   - Pass indoor/outdoor connecting wires ① and ② through the supplied ferrite core and wind them making a single turn, and then connect them to the terminals of the outdoor unit. Connect the indoor/outdoor connecting wire ③ and the earth wire directly to the outdoor unit terminals.
2. Attach the supplied clamp filter (gray) to the outdoor fan motor lead wire.
   - Attach the supplied clamp filter securely to the fan motor lead wire (lower) in the electric parts box of the outdoor unit.

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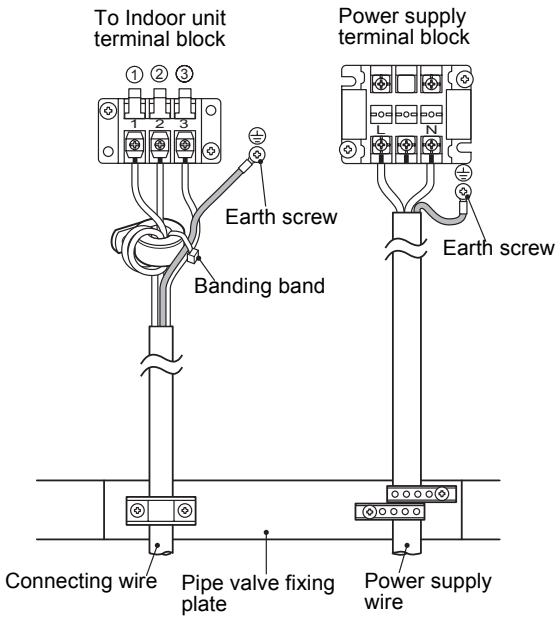
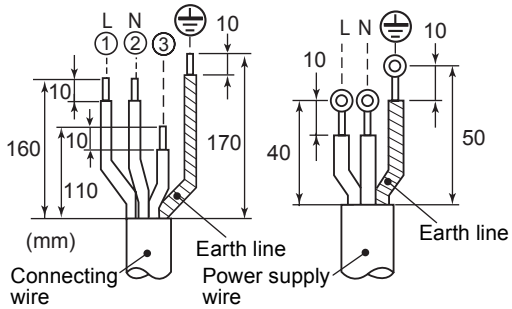
- For how to install the indoor unit, refer to the Installation Manual supplied with the indoor unit.

<1. Attaching the ferrite core>



* Clamp the indoor/outdoor connecting wire ③ and the earth wire together with the ferrite core with the supplied banding band.

Stripping length power cord and connecting wire



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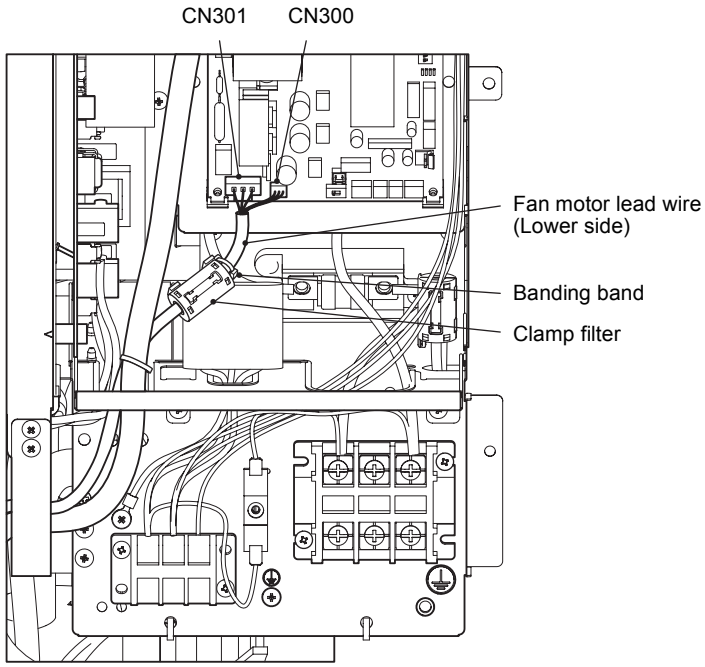
<2. Attaching the clamp filter>



Attach the supplied clamp filter to the lower outdoor fan motor lead wire.

- Make sure that the claw of the clamp filter is securely locked.
- Pass the supplied banding band through the upper hole of the clamp filter to clamp it together with the fan motor lead wire.
- The fan motor lead wires are connected to the connectors CN301 and CN300 on the P.C. board of the outdoor unit.

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8 EARTHING

⚠ WARNING

- **Be sure to connect earth wire. (grounding work)**
  Incomplete grounding cause an electric shock.

Connect the earth line properly following applicable technical standards.
Connecting an earth line is essential to prevent electric shock and to reduce noise and electricity charge on the outdoor unit surface due to high frequency generated by the frequency converter (inverter) in the outdoor unit.
If you touch the charged outdoor unit without earth line, you may feel electric shock.

9 FINISHING

After the refrigerant pipe, inter-unit wires, and drain pipe have been connected, cover them with finishing tape and clamp them to the wall with off-the-shelf support brackets or equivalent.
Keep the power wires and indoor/outdoor connecting wires off the valve on the gas side or pipes that have no heat insulator.

10 TEST RUN

- **Turn on the leakage breaker at least 12 hours before starting a test run to protect the compressor during startup.**
  To protect the compressor, power is supplied from the 220-240 VAC input to the unit to preheat the compressor.
- **Check the following before starting a test run.**
- **All pipes are connected securely without leak.**
- **The valve is open.**
  If the compressor is operated with the valve closed, the outdoor unit is overpressurized, which may damage the compressor or other components.
  If there is a leak at a connecting part, air is sucked and the internal pressure further increases, which may cause a burst or injury.
- Operate the air conditioner in the correct procedure specified in the Owner's Manual.

11 ANNUAL MAINTENANCE

- For Air conditioning system which is operated regularly, cleaning and maintenance of the indoor/outdoor units are strongly recommended.
  As a general rule, if an indoor unit is operated for about 8 hours daily, the indoor/outdoor units will need to be cleaned at least once every 3-month. This cleaning and maintenance shall be carried out by a qualified person.
  Failure to clean the indoor/outdoor units regularly will result in poor performance, icing, water leaking and even compressor failure.

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12 FUNCTIONS TO BE IMPLEMENTED LOCALLY

■ Handling Existing Pipe

When using the existing pipe, carefully check it for the following:

- Wall thickness (within the specified range)
- Scratches and dents
- Water, oil, dirt, or dust in the pipe
- Flare looseness and leakage from welds
- Deterioration of copper pipe and heat insulator

Cautions for using existing pipe

- Do not reuse the flare to prevent gas leak. Replace it with the supplied flare nut and then process it to a flare.
- Blow nitrogen gas or use an appropriate means to keep the inside of the pipe clean. If discolored oil or much residue is discharged, wash the pipe.
- Check welds, if any, on the pipe for gas leak.

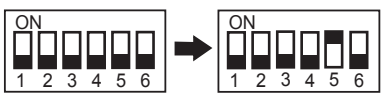
When the pipe corresponds to any of the following, do not use it. Install a new pipe instead.

- The pipe has been open (disconnected from indoor unit or outdoor unit) for a long period.
- The pipe has been connected to an outdoor unit that does not use refrigerant R22, R410A or R407C.
- The existing pipe must have a wall thickness equal to or larger than the following thickness.

Reference outside diameter (mm)	Wall thickness (mm)
Ø9.5	0.8
Ø15.9	1.0
Ø19.0	1.0

- Never use any pipe with a wall thickness less than these thicknesses due to insufficient pressure capacity.
- To use an existing Ø19.0 mm pipe, set bit 5 of SW801 (switch for existing pipe) on the P.C. board of the outdoor unit to ON. In this case, the heating performance may be reduced depending on the outside air temperature and room temperature.

SW801 No.5

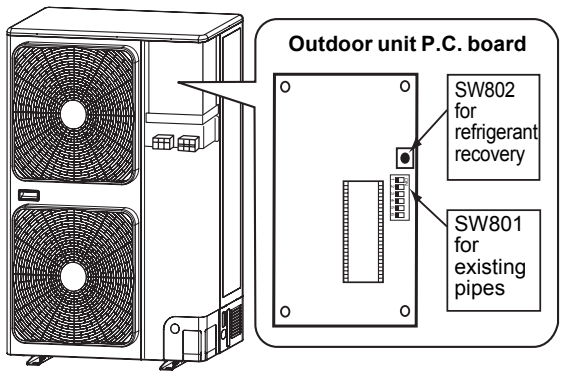


■ Recovering Refrigerant

- Use the refrigerant recovery switch SW802 on the P.C. board of the outdoor unit to recover refrigerant when the indoor unit or outdoor unit is moved.

Procedure

1. Turn on the power of the air conditioner.
2. Select the FAN mode for indoor unit operation with the remote controller.
3. Press the refrigerant recovery switch SW802 on the P.C. board of the outdoor unit to drive the air conditioner into the forced cooling mode for up to 10 minutes. Open the valve to start refrigerant recovery.
4. Upon completion of refrigerant recovery, close the valve and press SW802 for at least one second to stop operation.
5. Turn off the power.



⚠ DANGER

Take care for an electric shock because the P.C.board is electrified.

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13 TROUBLESHOOTING

You can perform fault diagnosis of the outdoor unit with the LEDs on the P.C. board of the outdoor unit in addition to check codes displayed on the wired remote controller of the indoor unit.
Use the LEDs and check codes for various checks. Details of check codes displayed on the wired remote controller of the indoor unit are described in the Installation Manual of the indoor unit.

LED indication and code checking

LED indication	Cycle control P.C. board LED indication				Cause
	D800	D801	D802	D803	
D800 ○ : Red D801 ○ : Yellow D802 ○ : Yellow D803 ○ : Yellow ◎ : Rapid flash ● : Go off ○ : Go on	○	●	●	●	Heat exchanger sensor (TE) error
	●	●	○	●	Suction sensor (TS) error
	○	○	●	●	Discharge sensor (TD) error
	●	○	●	○	Thermostat for compressor activated.
	●	○	●	●	Outdoor temperature sensor (TO) error
	○	○	○	●	DC outdoor fan error (Upper side)
	○	○	○	○	DC outdoor fan error (Lower side)
	○	●	●	○	Communication error between IPDU (Abnormal stop)
	●	○	●	○	Comp. case thermo. operate – Serial signal error
	●	○	○	●	Discharge temp. error
	○	○	●	○	EEPROM error
	●	●	○	○	Communication error between IPDU (No abnormal stop)
	◎	●	●	●	G – Tr short – circuit protection
	●	◎	●	●	Detect circuit error
	◎	◎	●	●	Current sensor error
	●	●	◎	●	Comp. lock error
	◎	●	◎	●	Comp. break down

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14 APPENDIX

Instruction of Works:
The existing R22 and R407C piping can be reused for our digital inverter R410A products installations.

NOTE

Confirmation of existence of scratch or dent of the former pipes to be applied and also confirmation of reliability of the pipe strength are conventionally referred to the local site.
If the definite conditions can be cleared, it is possible to update the existing R22 and R407C pipes to those for R410A models.

Basic conditions need to reuse the existing pipe

Check and observe three conditions of the refrigerant piping works.

1. **Dry** (There is no moisture inside of the pipes.)
2. **Clean** (There is no dust inside of the pipes.)
3. **Tight** (There is no refrigerant leak.)

Restricted items to use the existing pipes

In the following cases, the existing pipes cannot be reused as they are. Clean the existing pipes or exchange them with new pipes.

1. When a scratch or dent is heavy, be sure to use the new pipes for the works.
2. When the thickness of the existing pipe is thinner than the specified “Pipe diameter and thickness” be sure to use the new pipes for the works.
   - The operating pressure of R410A is high (1.6 times of R22 and R407C). If there is a scratch or dent on the pipe or thinner pipe is used, the pressure strength is poor and may cause breakage of the pipe at the worst.

*** Pipe diameter and thickness (mm)**

Pipe outer diameter		Ø6.4	Ø9.5	Ø12.7	Ø15.9	Ø19.0
Thickness	R410A	0.8	0.8	0.8	1.0	1.0
	R22 (R407C)					

- In case that the pipe diameter is Ø12.7 mm or less and the thickness is less than 0.7 mm, be sure to use the new pipes for works.

3. The pipes are left as coming out or gas leaks. (Poor refrigerant)
   - There is possibility that rain water or air including moisture enters in the pipe.
4. Refrigerant recovery is impossible. (Refrigerant recovery by the air purge operation on the existing air conditioner)
   - There is possibility that a large quantity of poor oil or moisture remains inside of the pipe.
5. A dryer on the market is attached to the existing pipes.
   - There is possibility that copper green rust generated.
6. Check the oil when the existing air conditioner was removed after refrigerant had been recovered. In this case, if the oil is judged as clearly different compared with normal oil
   - The refrigerator oil is copper rust green : There is possibility that moisture is mixed with the oil and rust generates inside of the pipe.
   - There is discolored oil, a large quantity of the remains, or bad smell.
   - A large quantity of sparkle remained wear-out powder is observed in the refrigerator oil.
7. The air conditioner which compressor was exchanged due to a faulty compressor. When the discolored oil, a large quantity of the remains, mixture of foreign matter, or a large quantity of sparkle remained wear-out powder is observed, the cause of trouble will occur.
8. Installation and removal of the air conditioner are repeated with temporary installation by lease and etc.
9. In case that type of the refrigerator oil of the existing air conditioner is other than the following oil (Mineral oil), Suniso, Freol-S, MS (Synthetic oil), alkyl benzene (HAB, Barrel-freeze), ester series, PVE only of ether series.
   - Winding-insulation of the compressor may become inferior.

NOTE

The above descriptions are results of confirmation by our company and they are views on our air conditioners, but they do not guarantee the use of the existing pipes of the air conditioner that adopted R410A in other companies.

Branching pipe for simultaneous operation system

- In the concurrent twin system and triple system, when TOSHIBA specified branching pipe is used, it can be reused.
  Branching pipe model name:
  RBC-TWP30E2, RBC-TWP50E2, RBC-TRP100E
  On the existing air conditioner for simultaneous operation system (twin, triple system), there is a case of using branch pipe that has insufficient compressive strength.
  In this case please change it to the branch pipe for R410A.

Curing of pipes

When removing and opening the indoor unit or outdoor unit for a long time, cure the pipes as follows:

- Otherwise rust may generate when moisture or foreign matter due to dewing enters in the pipes.
- The rust cannot be removed by cleaning, and a new piping work is necessary.

Place position	Term	Curing manner
Outdoors	1 month or more	Pinching
	Less than 1 month	Pinching or taping
Indoors	Every time	

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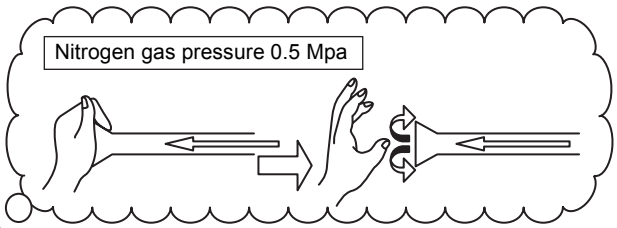
Is there no scratch or dent on the existing pipes?
YES → Existing pipes: Can not be used.
• Use a new pipes.

NO

Is it possible to operate the existing air conditioner?
NO →

YES

- For cleaning the pipes and recovering of oil
- After the existing air conditioner operated in cooling mode for approx. 30 minutes or longer*, recover the refrigerant.
- Refrigerant recovery: Pump down method



- Remove the existing air conditioner from the piping and carry out flashing (nitrogen pressure 0.5 Mpa) to remove the remains inside of the pipe.
  Note] In case of twin, also be sure to flash the branching pipe.

(If there is discharge of remains,
it is judged that there is a large quantity of remains.)

Was not largely discolored oil or a large quantity of remains discharged?
(When the oil deteriorates, the color of the oil changes to muddy and black color.)
YES → Clean the pipes or use the new pipes.

NO

■Connect the indoor/outdoor units to the existing pipe.
- Use a flare nut attached to the main unit for the indoor/outdoor units.
  (Do not use the flare nut of the existing pipe.)
- Re-machine the flare machining size to size for R410A.

■In case that the gas pipe Ø19 mm is used for the outdoor unit of SP80 (3 HP) or bigger:
(Gas pipe size of our R410A model 3 to 6HP is Ø15.9 mm)
→ Turn the existing pipe switch on the cycle control P.C board of the outdoor unit to ON side.
At shipment from factory OFF → ON for existing pipe (Refer to the table below.) (Be sure to set the contents in the table below in order to restrict the refrigerating cycle pressure of the equipment in the pipe standard.)

Existing pipe SW

	Switch
6 HP	Bit 5 of SW801 → ON

- (Airtight test), Vacuum dry, Refrigerant charge, Gas leak check

Trial run

Piping necessary to change the flare nut/ machining size due to pipe compression.

1) Flare nut width: H

(mm)

Copper pipe outer dia.	Ø6.4	Ø9.5	Ø12.7	Ø15.9	Ø19.0
For R410A	17	22	26	29	36
For R22	Same as above		24	27	Same as above

2) Flare machining size: A

(mm)

Copper pipe outer dia.	Ø6.4	Ø9.5	Ø12.7	Ø15.9	Ø19.0
For R410A	9.1	13.2	16.6	19.7	24.0
For R22	9.0	13.0	16.2	19.4	23.3

Becomes large a little for R410A

Do not apply the refrigerator oil to the flare surface.

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